

REMARKS

The Present Invention and Pending Claims

Claims 1-9 are pending and directed to a release sheet (claims 1-4 and 6-8) and a pressure-sensitive adhesive sheet comprising the release sheet (claims 5 and 9). The release sheet has a suitably reduced peeling strength from the pressure-sensitive adhesive layer as compared to conventional release sheets using an ethylene polymer. The invention is predicated, at least in part, on the discovery that a release sheet having a suitable and practical peeling strength can be provided by adjusting the spin-spin relaxation time (T_2) and the ratio of the amorphous region of the ethylene polymer to specific ranges, or by adjusting the bearing ratio of the surface of the release sheet containing the ethylene polymer to a specific range.

Amendments to the Claims

Claims 1, 5, 6, and 9 have been amended to point out more particularly and claim more distinctly the present invention. Claims 1 and 6 have been amended to correct grammatical errors. As suggested by the Office, claims 5 and 9 have been amended to place the claims in independent form. Claim 6 has been amended to remove reference to the method for calculating the bearing ratio of the release sheet. Accordingly, no new matter has been introduced by way of these amendments.

Summary of the Office Action

The Office objects to claims 5 and 9. Claim 6 is rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Claims 1-4 and 6-8 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by *Polymer Processing Technology*, Japan Polyolefins Co. Catalog, 2000 (reprinted from <http://www.jpa.co.jp>). Claims 1-4 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over JP 11-060634 (Yahiro). Claims 5-9 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over JP 11-060634 (Yahiro) in view of U.S. Patent 4,713,273 (Freedman). Claims 1-9 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent 5,948,517 (Adamko et al.) in view of U.S. Patent 4,713,273 (Freedman). The Office additionally rejects claims 5 and 9 under 35 U.S.C. § 103(a) as allegedly unpatentable over the aforementioned *Polymer Processing Technology* reference in view of International Patent Application WO 99/14281 (Hennen). Reconsideration is hereby requested.

Discussion of the Claim Objections

Claims 5 and 9 have been amended to place the claims in independent form as suggested by the Office. As such, Applicants believe that the objections to claims 5 and 9 are moot and should be withdrawn.

Discussion of the Rejections under Section 112, Second Paragraph

The Office contends that claim 6 is a product claim that recites a method feature (i.e., “wherein a bearing ratio obtained by measuring the surface of the layer comprising the ethylene polymer with an atomic force microscope is -30 to 15 ”). The Office indicates that the method feature was not given patentable weight, because the method of measuring a physical attribute of an article is not relevant to the patentability of the article. The Office requires clarification or correction of claim 6.

As described in the specification at, for example, page 7, line 32, through page 8, line 27, the bearing ratio is a parameter showing the level of changes in the surface shape (roughness) of the outermost surface of a sample and an inner surface from the outermost surface, based on a tapping force (forcibly inserting force) toward the sample. During the measurement of the bearing ratio, the shape of the outermost surface of the sample is shown with a mode of weak tapping force, and the shape of the inner surface is shown with a mode of strong tapping force. A large bearing ratio corresponds to extremely different properties (particularly properties relating to hardness) between the surface and the inside of the sample. When the bearing ratio is small, the structure is uniform from the surface to the inside of the sample (e.g., uniform hardness). Thus, the bearing ratio of -30 to 15 recited in claim 6 is a physical characteristic of the release sheet. In order to advance prosecution, and not in acquiescence of the rejection, claim 6 has been amended to remove reference to the method by which the bearing ratio is obtained. Accordingly, Applicants believe the rejection of claim 6 is moot and should be withdrawn.

Discussion of the Rejections under Section 102(b)

The Office contends that it was well known to use linear ethylene resins (e.g., J-REX LL-type and Hormorex LL-type resins) to produce release paper as described in *Polymer Processing Technology*, Japan Polyolefins Co. Catalog, 2000 (reprinted from <http://www.jpa.co.jp>) (“the Polymer Processing Technology reference”). The Office admits that the Polymer Processing Technology reference does not describe a specific spin-spin relaxation time or bearing ratio of the resin, but the Office contends that these properties are inherent to the resin.

The "release paper" described in the Polymer Processing Technology reference generally refers to a release paper having a laminate layer made from an ethylene polymer formed on a substrate, such as paper and the like, and a release agent, such as silicone and the like, coated thereon, or a release agent coated on the ethylene polymer layer (see, e.g., the descriptions of various release papers at page 173, Table 1, of Adherence Handbook, 2nd edition, edited by the Japan Adhesive Tape Industry Association Adherence Handbook Editorial Board (1995) (English translation of Table 1 of page 173 provided herewith)). In other words, the ethylene polymer is not used as a release layer. In contrast, the release sheet of the invention uses an ethylene polymer as a release layer, and is characteristically free of a release agent and the like (see, e.g., page 2, lines 9-31, of the specification). Because an ethylene polymer is used as a release layer in the present invention, it is essential to the invention that the properties (e.g., spin-spin relaxation time, ratio of the amorphous region, or bearing ratio) of the ethylene polymer are within the ranges recited in the pending claims.

In the Polymer Processing Technology reference, various J-REX LL-type resins and Harmorex LL-type resins are described; however, the constitution of a release sheet for a pressure-sensitive adhesion sheet containing an ethylene polymer having the specific claimed properties is not described. Thus, the Polymer Processing Technology reference does not teach all of the elements of the pending claims. For this reason, the anticipation rejection is improper and should be withdrawn.

Discussion of the Rejections under Section 103(a)

The Office has rejected the pending claims for allegedly defining obvious subject matter in view of several references. These rejections are traversed for the following reasons.

A. JP 11-060634 (applied to pending claims 1-4)

The '634 reference does not teach or suggest the use of an ethylene/ α -olefin copolymer resin for a release sheet as in the present invention; rather the '634 reference discloses the use of the resin for a film and a pipe. In contrast to the present invention, the '634 reference does not recognize the importance of obtaining a release sheet with a suitably reduced peeling strength from the pressure-sensitive adhesive layer. As discussed above, the present invention is predicated, at least in part, on the discovery that a release sheet having a suitable and practical peeling strength can be provided by adjusting the spin-spin relaxation time (T_2) and the ratio of the amorphous region of the ethylene polymer to specific ranges, or by adjusting the bearing ratio of the surface of the release sheet containing the ethylene polymer to a specific range. The '634 reference does not teach or suggest the adjustment of

the spin-spin relaxation time (T_2) of an ethylene polymer to 130-350 μ s at 30° C and the ratio of the amorphous region to 7-17%, as recited in the claims, to ensure suitable and practical peeling strength of the release sheet. Thus, because the '634 reference does not teach or suggest all the elements of the pending claims, or provide motivation for one of ordinary skill in the art to modify the resin of the '634 reference to arrive at the present invention, the pending claims cannot be considered to be obvious in view of the '634 reference.

B. JP 11-060634 and US 4,713,273 (applied to pending claims 5-9)

The '273 reference teaches the use of a release liner having a specific surface roughness together with an adhesive layer for the purpose of imparting surface roughness to an adhesive layer during forming steps to prevent the mixing of air bubbles during the adhesion of an adhesive. The '273 reference does not recognize the importance of obtaining a release sheet with a suitably reduced peeling strength from the pressure-sensitive adhesive layer. Furthermore, the '273 reference does not teach setting the bearing ratio of a polymer surface to a predetermined range to provide such a release sheet. As described above, the bearing ratio does not refer merely to surface roughness, but rather is a parameter defining the level of changes of the surface roughness in the sheet depth direction. Accordingly, even if one of ordinary skill in art were to prepare a release liner with the specific surface roughness disclosed in the '273 reference, it would not be apparent from the '273 reference to use an ethylene polymer having a bearing ratio of -30 to 15 to promote superior reduced peeling strength, or even to use the bearing ratio as an index of uniformity in the surface roughness in the depth direction.

As discussed above, the '634 reference does not teach or suggest providing a release sheet having suitable and practical peeling strength by adjusting the bearing ratio to the range recited in the pending claims. Accordingly, even if the disclosures of the '634 and '273 references were combined, one of ordinary skill in the art would not have been motivated to arrive at the present invention. For these reasons, the combination of the '634 and '273 references cannot be considered to render obvious the present invention.

C. US 5,948,517 and US 4,713,273 (applied to pending claims 1-9)

The '517 reference teaches an ethylene polymer which exhibits a small peeling strength as a release film. Specifically, the '517 reference teaches the use of an ethylene polymer with low density (0.865g/cc to 0.900 g/cc) and low dispersivity (less than 5.0) that is suitable for a release film. In contrast, the present invention is achieved by the use of an ethylene polymer with a spin-spin relaxation time (T_2) and a ratio of the amorphous region

within specific ranges, or an ethylene polymer having a bearing ratio of the surface within a specific range, to provide a release sheet with superior peeling property. Thus, the means of preparing release sheets with superior peeling properties are achieved by different means in the present invention and the '517 reference. Indeed, the ethylene polymer used in the Example of the '517 reference is completely different from the ethylene polymer used in the present invention.

The Office admits that the '517 reference does not teach the claimed spin-spin relaxation time of the amorphous region of the ethylene polymer or the ratio of the amorphous region; however, the Office contends that, since the '517 reference teaches that the low density polyethylene is a metallocene-catalyzed polymer that is highly amorphous and low in crystallinity, it would have been obvious to have modified the composition and physical structure of the polymer of the '517 reference such that the polymer would exhibit the spin-spin relaxation times and amorphous region ratios recited in the pending claims. Specifically, the Office contends that the spin-spin relaxation time and ratio of the amorphous region are directly related to the material composition and the physical structure of the material, and optimization of the values involves only routine skill. However, the mere use of an amorphous and low crystallinity ethylene polymer is not sufficient to obtain a release sheet having low peeling strength. The '517 reference teaches that it is only when the density and dispersivity of the ethylene polymer are at optimum levels that a release sheet having low peeling strength can be obtained. Accordingly, the disclosure of the '517 reference does not teach or suggest the relationship between peeling strength and the spin-spin relaxation time (T_2) and a ratio of the amorphous region of a release sheet. Therefore, the disclosure of the '517 reference cannot be considered to motivate one of ordinary skill in the art to modify the spin-spin relaxation time and ratio of the amorphous region of the polymer of the '517 reference so as to arrive at the values recited in the pending claims to obtain a release sheet with reduced peeling strength.

Additionally, it would not have been obvious for one of ordinary skill in the art to modify the bearing ratio of the copolymer of the '517 reference based on the teachings of the '273 reference. As discussed above, even if one of ordinary skill in art were to prepare a release liner with the specific surface roughness disclosed in the '273 reference, it would not be apparent from the '273 reference to use an ethylene polymer having a bearing ratio of -30 to 15 to promote superior reduced peeling strength, or even to use the bearing ratio as an index of uniformity in the surface roughness in the depth direction.

Accordingly, even if one of ordinary skill in the art were motivated to combine the '571 and '273 references, the combination of the references would not necessarily result in

the release sheet and pressure-adhesive sheet of the present invention. For these reasons, the combination of the '571 and '273 references cannot be considered to render the pending claims obvious.

D. The Polymer Processing Technology reference and WO 99/14281 (applied to pending claims 5 and 9)

As discussed above, the Polymer Processing Technology reference does not recognize the importance of providing a pressure-sensitive adhesive sheet comprising a release sheet with superior peeling property that comprises an ethylene polymer with properties (e.g., spin-spin relaxation time, ratio of the amorphous region, or bearing ratio) in the specific ranges recited in the claims.

The '281 reference teaches the use of ultra low-density polyethylene having low density and low dispersivity as a release sheet. The '281 reference does not teach a pressure-sensitive adhesion sheet comprising a release sheet that is superior in peeling property. In contrast, the present invention is directed to a release sheet comprising ethylene polymer that is superior in peeling property, wherein the release sheet has a spin-spin relaxation time (T_2) and a ratio of the amorphous region, or a bearing ratio, within the specific ranges recited in the claims. Moreover, the ethylene polymers used in the Examples of the '281 reference are completely different from the ethylene polymer used in the present invention.

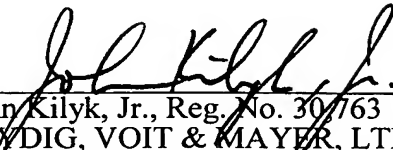
Therefore, because neither reference, alone in combination, teaches or suggests a pressure-sensitive adhesion sheet comprising a release sheet with the claimed properties, the pending claims cannot be considered to be obvious in view of the '281 and Polymer Processing Technology references.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

In re Appln. of Yamamoto et al.
Application No. 10/007,493

Respectfully submitted,



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引用文献

- 1) 特公昭29-3144 (3 M)
- 2) 特公昭44-9599 (J & J)
- 3) 特開昭63-202685 (日東電気工業㈱)
- 4) 特公昭43-21855 (積水化学㈱)
- 5) Can.P 844694 (Canadian Tech Tape)
- 6) 特公昭29-2987 (3 M)
- 7) 特公昭60-23796 (一方社油脂工業㈱)
- 8) 特公昭29-733 (3 M)
- 9) 特公昭34-976 (保土ヶ谷化学㈱, ニチバン㈱)
- 10) 特公昭60-30355 (一方社油脂工業㈱)
- 11) 特開平2-197577 (㈱スリオンテック)
- 12) 特公昭38-3382 (保土ヶ谷化学㈱, ニチバン㈱)
- 13) 特開昭54-7442 (一方社油脂工業㈱)
- 14) W.A.Zisman: Ind.Eng.Chem., Vol.55 [10] 19 (1963)
- 15) K.Kamagata and M.Toyama: J.Applied Polymer Sci, Vol.18 167 (1974)
- 16) 熊谷紳一: 粘着専門委員会第26回例全発表要旨
- 17) 『化学便覧(応用編)』, 831

3.5 剥離ライナー

3.5.1 はじめに

日本の剥離紙の生産量はこれまで着実に伸びを示し、1995年現在少なくとも見積っても月産1億5千万m²を超える規模に成長した。剥離紙は、粘着ラベル・両面テープその他の粘着・接着製品の裏打ち材料(剥離ライナー、release liner、liner)として、また包装用クラフト粘着テープの基材として使われている。合成皮革やファインセラミックスシートの製造工程でキャリアとしても使われている。このキャリア用の剥離紙は特に工程紙(casting paper、processing paper)とよばれている。その他、食品・新素材分野でも剥離紙は使われ、欠かせない材料となってきた。そして、剥離紙の用途が広がるにつれ、その機能も多様化・高度化してきた。ここでは剥離紙の中で最も量的に多い剥離ライナーについて、種類と特徴を述べる。なお、クラフト粘着テープ基材については「2.1.1クラフト紙粘着テープ」を、また工程紙については後述の文献¹¹⁾を参照されたい。

3.5.2 種類と特徴

剥離ライナーは使用している基材・剥離剤の種類、機能、用途などによって分類できる。

(1) 基材による分類

剥離ライナーを基材の種類で分類すると表1のようになる。日本で多く使われているのはポリエチレンラミネート（ポリラミ）タイプとグラシンタイプである。ポリエチレンラミネートタイプの原紙には上質紙、クラフト紙が多く使われている。ところで、これらの原紙に剥離剤を直接塗工すると、剥離剤が紙の内部に浸み込んでしまい表面に均一な塗膜が形成しにくい。均一な剥離剤塗膜ができないと良好な剥離性能が得られない。そこで、剥離剤の浸み込みを防ぐためにポリエチレンを目止剤として使う。ポリエチレンとしては低密度ポリエチレンがほとんどだが、低密度ポリエチレンより耐熱性のよい高密度ポリエチレンと低密度ポリエチレンのブレンド系が使われることもある。ポリエチレンラミネートタイプの特長は良好な表面光沢・平滑性が得やすく、耐水性・耐溶剤性もよいことである。欠点としては、ポリエチレンを使用しているため耐熱性がよくない、古紙として利用する場合再生紙化が難しいことがあげられる。ポリエチレンラミタイプとともに代表的であるグラシンタイプでは、上質紙やクラフト紙に比べ密度が高く緻密な構造を有するグラシン紙を原紙としているため、剥離剤の浸み込みが少なく、紙に直接剥離剤を塗工することができる。また耐熱性、光透過性がよいことが特長である。光透過性は、光電管を利用した粘着ラベルの自動貼り作業を可能にしている。グラシンタイプの欠点は紙の密度が高いため吸湿による寸法変化が大きくカールしやすいことである。ところで、ヨーロッパではこのグラシンタイプが最も多く使用されている。ただし、使われているグラシン紙は日本より密度が高いものが一般的である。なお、ポリエチレンラミタイプはヨーロッパ、アメリカではきわめて少ない。実は、ポリエチレンラミタイプは日本で生まれ育った独特のものといえる。ちなみにアメリカで最も多く使われているのは、次に述べるスーパーカレンダー（supercalendered）タイプである。

紙の原料パルプの叩解度を高め密度を高くし、かつスーパーカレンダー処理により表面をより緻密な構造としたものに直接剥離剤を塗工したのが、スーパーカレンダータイプである。耐熱性がよいことが特長であるが、吸湿寸法安定性はグラシンタイプと同様よくない。

上質紙やクラフト紙などにクレー・バインダを目止剤として塗工したタイプのライナーもかなり使われている。耐熱性がよく、比較的密度の低い紙を用いることにより吸湿寸法安定性のよいものが得られるのもこのタイプの特長である。ポリラミタイプと比べると表面の光沢・平滑性が劣るのが一般的だが、スーパーカレンダー処理によりこれらの性質を改良したものもある。

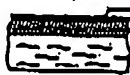
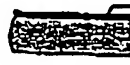

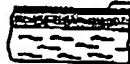
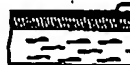
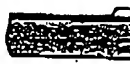
PVA・デンプン・CMC（カルボキシメチルセルロース）などを塗工したタイプのライナーもある。耐熱性に加え耐油性がよいのが特長である。吸湿寸法安定性のよいものも可能である。表面光沢・平滑性のよいものは得にくい。

プラスチックフィルムを基材としたものも近年かなり使われるようになった。フィルムの種類としてはPET、OPP、CPP、PEなどがあるが、PET、OPPの量が多い。フィルムタイプの

特長は、紙基材では得にくい平滑性・光沢・透明性・クリーン性・耐水性・厚みの均一性が優れている点である。耐熱性は紙を基材とするものに比べ劣る。

以上が主なものであるが、この他にキャストコート紙、含浸紙、クレープ紙、ポリプロピレンラミネード紙を基材としたものもある。

表1. 基材による剥離ライナーの分類

記号	名 称	構 成 (断 面 図)	長 所	短 所
A	ポリエチレン・ラミネートタイプ		平滑性、光沢性、耐水性	耐熱性
B	グラシンタイプ		耐熱性、光透過性	吸湿寸法安定性
C	スーパーカレンダードタイプ		耐熱性	吸湿寸法安定性
D	クレーコートタイプ		耐熱性、吸湿寸法安定性	平滑性、光沢性
E	水系樹脂コートタイプ		耐熱性、耐油性、吸湿寸法安定性	平滑性、光沢性
F	フィルムタイプ		クリーン性、吸湿寸法安定性、平滑性、透明性、光沢性、耐水性	耐熱性

(注) 剥離剤としてはシリコンが最も多いが、非シリコン系のものが使われることもある。

(2) 剥離剤による分類

剥離ライナーを剥離剤の種類によって分類するとシリコン系と非シリコン系に大別できる(図1)。

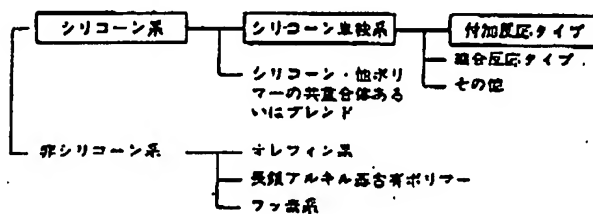


図1. 剥離剤による剥離ライナーの分類


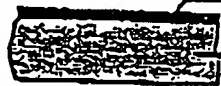
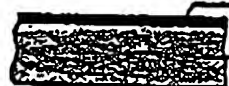
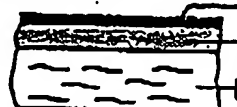
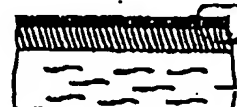
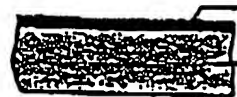
ADHERENCE HANDBOOK (second edition)

Published on October 12, 1995

Editor Japan Adhesive Tape Industry Association
Adherence Handbook Editorial Board

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Table 1. Classification of release liner based on substrate

Symbol	Name	Constitution (cross section)
A	Polyethylene laminate type	 <p>silicone polyethylene fine paper, kraft paper and others</p>
B	Glassine type	 <p>silicone kraft paper or parchment paper</p>
C	Super calendered type	 <p>silicone super calendered paper</p>
D	Clay coat type	 <p>silicone clay-binder fine paper, kraft paper and others</p>
E	Aqueous resin coat type	 <p>silicone PVA, starch, CMC etc fine paper, kraft paper and others</p>
F	Film type	 <p>silicone plastic film (PET OPP, CPP, PE)</p>